

Laparoscopic Appendectomy with Clipping versus Intra-Corporeal Ligation for Securing the Appendiceal Stump

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Abstract:

Background: Various techniques have been used for securing the appendicular stump, some of which is expensive as endoscopic linear cutting stapler (7,8); others are not available in some hospitals as preformed suture loops (endoloops). We raise the question of safety and effectiveness of securing the appendicular stump by clipping versus intra-corporeal ligation in laparoscopic appendectomy to patients with acute appendicitis.

Aim: We compare between clipping versus intra-corporeal ligation of appendiceal stump regarding safety, timing of operation and difficulty.

Patients and Methods: Forty patients presented with acute appendicitis at Damanhour Teaching Hospital and Theodor Bilhariz Research Institute (TBRI), the diagnosis was based on clinical diagnosis, laboratory and ultrasonographic findings. They were divided randomly into two groups: Group I: Metal Clip group (MC Group), and Group II: Intra-corporeal ligation group (ICL Group).

Results: There was no statistically significant difference between patients of both groups as regarding age or gender while group II were significantly higher in operative duration. Group I is higher in the rate of conversion to open and post-operative complications. There have been no statistically significant differences regarding hospital stay.

Conclusion: The two techniques of clip application and ligation are effective in securing the appendicular stump in laparoscopic appendectomy. With increasing the skills of ligation we prefer ligation *over clipping especially with large, hard and friable appendiceal stump.*

Keywords: Acute appendicitis, securing the appendiceal stump, clipping versus ligation.

Introduction:

The first laparoscopic appendectomy done in the 1970s by gynecologists. The standard operation of acute appendicitis is laparoscopic appendectomy where minimal invasive surgery is performed⁽¹⁾.

Laparoscopic appendectomy is a routine surgery in residency programs⁽²⁾ and present once laparoscopic surgery can be performed. One of the most prevalence of laparoscopic appendectomy is abdominal exploration especially pelvic issues⁽²⁾ open appendectomy is now declining with upper hand of laparoscopic appendectomy⁽³⁾. Still open appendectomy preferred in some centers over laparoscopic appendectomy⁽⁴⁾.

Still the best technique to close the base of the appendix is controversial, where it may be by clipping, ligation, vessel ceiling or stapler⁽⁵⁾.

With laparoscopic appendectomy there is less pain, short hospital stay, good cosmetic outcome and rapid recovery. Another major advantage is the diagnostic laparoscopy done initially in any case of acute abdomen and is very helpful in doubtful cases especially in females⁽⁶⁾.

Various techniques have been used for securing the appendicular stump, some of which is expensive as endoscopic linear cutting stapler (Endo-GIA)^(7,8); others are not available in some hospitals as preformed suture loops (endoloops). Appendiceal stump control also has been tried by metallic clips but not on a large scale, the problem of the technique of metallic clips is that some surgeons are not confident with its safety⁽⁸⁾.

Aim of Work:

We compare between clipping versus intra-corporeal ligation of appendiceal stump regarding safety, timing of operation and difficulty.

Patients and Method:

All patients were admitted in Damanhour Teaching Hospital and Theodor Bilhariz Research Institute (TBRI) from 2017 to 2019, to perform laparoscopic appendectomy as a treatment for patients with acute appendicitis. All patients were consented before being included in the study. The study was approved by local ethics and research committee of Damanhour Teaching Hospital.

This study was carried out on 40 patients divided randomly in two groups,

Group I: Metal Clip group (MC Group)

Group II: Intra-corporeal ligation group (ICL Group)

Inclusion criteria:

All cases of acute appendicitis that were subjected to laparoscopic appendectomy were included in the study

Exclusion criteria:

1. Appendicular mass which was diagnosed either by ultrasound or by examination under anesthesia were excluded of the study
2. Cases with perforation at the base

All patients were subjected to classic history taking, examination and investigation .

Laboratory investigation:

Leukocytes and Neutrophils, routine investigation, abdominal ultrasound.

Before surgery, all patients were examined under general anesthesia after giving broad spectrum antibiotic with insertion of urinary catheter and when a mass was felt, the case was excluded from the study.

Surgical techniques:

The first step was insertion of 10-mm trocar transumbilical, followed by insufflation of abdominal cavity by CO₂ then placing the patient on Trendelenburg position and to the left then placing 2nd trocar 10-mm Lt midclavicular 2 finger from left anterior superior iliac spine followed by placing the third trocar 5-mm in the midline one finger above symphysis pubis. Exploration of the abdomen through 10-mm 30 degree telescope introduced through umbilical port, identification of appendix through Tenia coli then devascularization in both groups was started: Devascularization was done by hook or Maryland connected to monopolar diathermy. Dissection was done in close proximity to the wall of the appendix. This has two advantages: the first is less blood loss because the plane between the appendix and the meso-appendix is loose areolar tissue and the second is easy retrieval of the appendix after its excision (Figure 1).



Figure1: After dissection of mesoappendix.

The second step in ligation group is to make a window in the meso-appendix near the base and pass a ligature of Vicryl (polyglactin) 0 by intra-corporeal knotting technique: two proximally and one distally and cut in between (Figure 2).

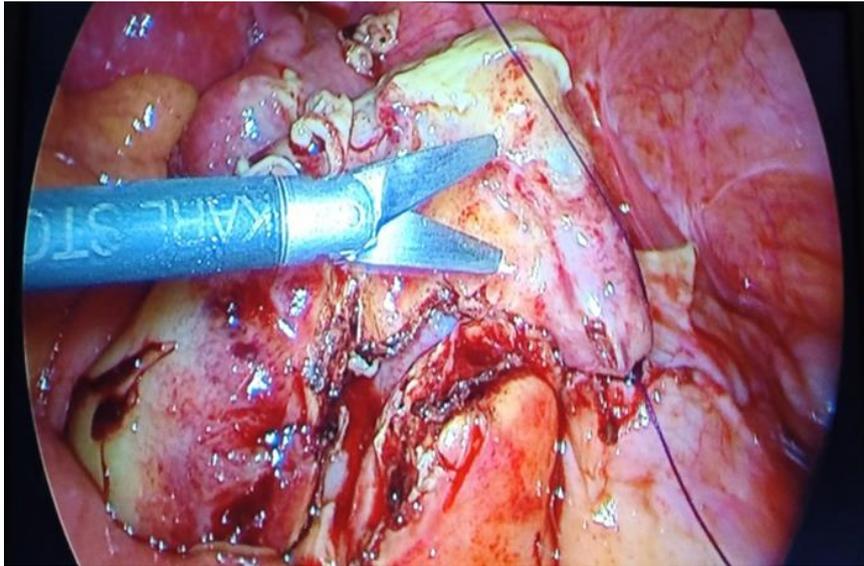


Figure 2: Ligation of the appendices stump.

The second step in clip group after devascularization first is to clipping it by 3 clips (medium or large according to diameter of the base) two proximally and one distally and cut in between (Figure 3).

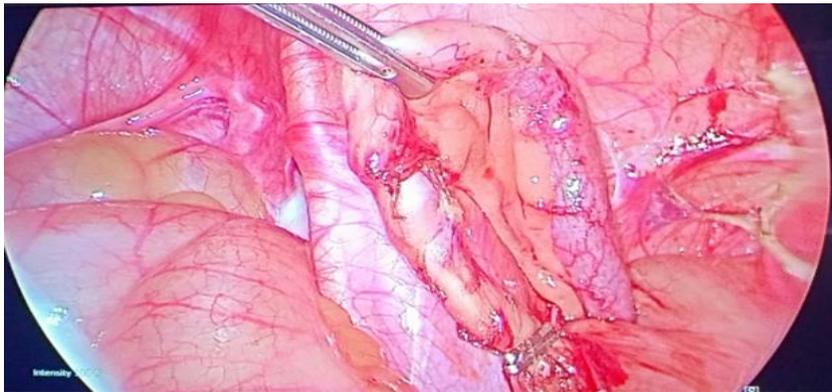


Figure 3: Clipping the appendices stump.

The abdominal cavity was finally searched for any collections or bleeding. No drains were inserted except in cases of perforated appendix.

The appendix was retrieved without meso-appendix through the port of the left iliac fossa and sent routinely for histo-pathological examination (Figure4).

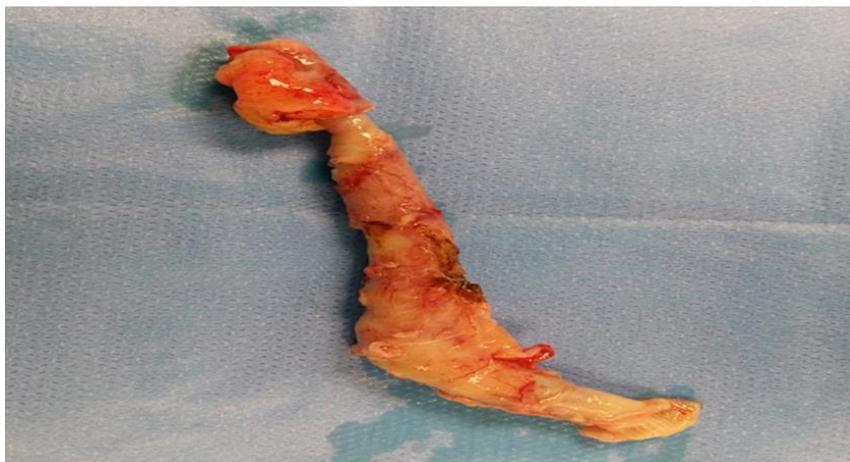


Figure 4: Retrieved appendix without meso-appendix.

Then closure of skin by high dermal inverted suture by vicryl 2-0.(Figure 5).



Figure5: Skin closure by high dermal inverted sutures).

Statistical analysis:

The data were collected and coded then processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 21. Qualitative data was presented as number and percent. Chi-Square test used to compare between the two groups also Student t-test. Mann – Whitey U test and Fischer exact test. P value<0.05 considered as statistically significant.

Results:

In total 40 patients, divided into two equal groups, group I use clipping and group II use intra-corporeal ligation, the demographic data of the two groups was mentioned in Table 1. From Table (1), it was found that the basic demographic data (age and sex) of the two studied groups was matched without significant difference ($p>0.05$). The clinical and preoperative laboratory data, show insignificant difference in the two studied groups. Regarding leukocytes, neutrophils, duration of symptoms and body temperature, all patients obey the inclusion criteria.

Table (1): Basic characteristic laboratory and clinical data feature of the studied groups

	Group I (n=20)	Group II (n=20)	p
	24.6±3.98	22.3±4.02	0.408
Sex			
Male	8 (40.0%)	10 (50.0%)	0.511
Female	12 (60.0%)	10 (50.0%)	
Clinical data and preoperative laboratory values			
Leukocytes (x109/L)	14.32±2.98	15.1±2.41	0.21
Neutrophils (%)	80.3±9.12	86.2±8.45	0.36
Duration of symptoms (h)	19.2±8.25	20.1±7.65	0.385
Body temperature (°C)	37.8±0.42	37.6±0.51	.0621

Table (2): show the comparison of the two studied groups including the operative data and post-operative data and complications, it was found that there was a significant increase in the operative duration in group II more than group I which was gradually decreased by increasing learning curve, while the hospital stay was matched in the two groups without significant difference ($p > 0.05$).

The incidence of complications was significantly higher in group I more than group II, especially failure of technique, the overall complication was significantly higher in group I more than group II.

Table (2): Comparison between the two groups regarding operative and post-operative data

	Group I (n=20)		Group II(n=20)		p
Duration of surgery (min)	42.0±14.2		55.6±18.2		0.013*
Hospital stays (days)	1.62±0.46		1.77±0.38		0.426
Complications					
Intestinal injury	0	0.0	0	0.0	-
Abdominal abscess	1	5.0	0	0.0	-
Port site infection	1	5.0	1	5.0	1.0
Failure of technique	2	10.0	0	0.0	0.042*
Re-admission	1	5.0	0	0.0	.087
Re-operation	1	0.0	0	0.0	-
Total complication	5	25.0	1	5.0	0.0036*

Discussion:

Energy for cutting and hemostasis used for laparoscopic appendectomy is usually modified, In the last decades there is great advance in electrosurgical instruments as in laparoscopic surgery^(9,10). This advanced Electrosurgical instruments is not safe regarding their thermal spread used⁽¹¹⁻¹²⁾.

But with the new electro surgical instruments less thermal spread, less intra and post-operative complications⁽¹³⁾.

In Our study we showed significant difference in operative time in group II and significant difference in group I in operative complications.

Electrosurgical instrument application reporting high incidence of thermal effect ⁽¹⁴⁻¹⁷⁾. Because of direct or capacitive coupling or insulation failure.

The best electrosurgical instrument could provide good hemostasis with no thermal energy spread. With the use of LigaSure and Harmonic scalpel, they show thermal spread limited to an area less than 1.5 mm and 1.6 mm, respectively ⁽¹⁸⁾. Ultrasonic energy delivered through a harmonic scalpel has been shown to be safe and to produce minimal damage to the surrounding tissue ⁽¹⁹⁾.

Sahm et al. ⁽²⁰⁾ confirmed, in their study that intra-corporeal ligation is a good choice in comparison to linear stapler or endoloop but no significant difference in safety and efficacy.

In another study by Kiudelis et al. ⁽²¹⁾, reported that intra-corporeal ligation is a safe method, and cheaper than endoloop technique. Compared with laparoscopic staplers end loops have an advantage as they are 6 to 12 times cheaper than stapling device ⁽²²⁾, this was matching with our study since no major complications occurred with intra-corporeal ligation, the cost of ligation is less because we just used 1 ampoule of polyglactin 0 which might be used to close the port site as well in many cases, one other advantage of intra-corporeal ligation is its applicability in all cases.

Our study matched with results of other studies (Ateset al. ²³; Gonenc et al. ²⁴), that using metallic clips for appendicular stump closure is safe and associated with less operative time in laparoscopic appendectomy. It also makes the procedure simpler and provides a useful alternative of intra-corporeal ligation.

Conclusion:

The two techniques of clipping and ligation are effective in securing the appendicular stump in laparoscopic appendectomy. With increasing the skills of ligation we prefer ligation over clipping especially with large, hard and friable appendiceal stump.

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